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EXAMINER	
GEBRESILASSIE, KIBROM K	
ART UNIT	PAPER NUMBER
2128	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/538,763	SLONAKER, STEVEN DOUGLAS	
	Examiner	Art Unit	
	KIBROM GEBRESILASSIE	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *30-41* is/are allowed.

6)☒ Claim(s) *1-15,21-29 and 42-48* is/are rejected.

7)☒ Claim(s) *16-20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is responsive to amended application filed on 09/23/2009.

2. Claims 1-48 are presented for examination.

Response to Arguments

3. Applicant's argument relating to claim interpretation is not persuasive.

a. Applicant's indicates "Applicants submits that intended use applies to apparatus and article claims. That is, MPEP 2114, which is titled "Apparatus and Articles Claims-Functional Language," is specifically directed to apparatus and articles claims and is inapplicable to method claims".

Examiner respectfully disagrees. An intended use is also applicable to method claims. Examiner would like to direct to the following MPEP that states:

> "USPTO personnel are to correlate each claim limitation to all portions of the disclosure that describe the claim limitation. This is to be done in all cases, regardless of whether the claimed invention is defined using means or step plus function language. The correlation step will ensure that USPTO personnel correctly interpret each claim limitation.
>
> The subject matter of a properly construed claim is defined by the terms that limit its scope. It is this subject matter that must be examined. As a general matter, the grammar and intended meaning of terms used in a claim will dictate whether the language limits the claim scope. Language that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation. The following are examples of language that may raise a question as to the limiting effect of the language in a claim:
>
> (A) statements of intended use or field of use,
> (B) "adapted to" or "adapted for" clauses,
> (C) "wherein" clauses, or
> (D) "whereby" clauses.

In this case, the grammar and intended meaning of the subject matter such as " **eliminates the need for** a full simulation calculation each and every time new specified aberration values are provided and presented for calculation

of a new image profile" of claim 15, is just an intended use that suggests or makes optional but does not require steps to be performed.

4. Applicant's argument relating to 102 rejection is not persuasive.

b. Applicants argue that Miwa et al does not disclose "performing simulation calculations for various levels for each aberration component using the imaging configuration characteristics data using a processor of the one or more computing device" as recited in claims 1, 47, and 48.

Examiner respectfully disagrees. Miwa et al discloses "the exposure energy and focus offset according to the illumination parameters for an exposure device and optical projection system, using information regarding the projection lens aberrations of a plurality of exposure devices, the photoresist parameters and the circuit pattern information, as determined beforehand, are calculated using an optical development simulator, and the exposure processing is carried out using an exposure device" (See: Abstract lines 15-26).

5. Applicant's argument relating to 103(a) rejection is not persuasive.

c. Applicant's argue:

"The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce *a prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness. See MPEP §2142. To establish *a prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.[2] Second, there must be a reasonable expectation of success. Finally, the prior art reference" (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Applicant Submits that the combination of references do not teach or suggest each of the features of the present invention" (Remarks, pg. 23 first paragraph).

In response to applicant's argument, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Miwa et al fails to disclose fitting coefficients values using the response surface functional relation. Seltmann et al cure the deficiency by disclosing fitting coefficients values using the response surface functional relation (such as “calculate a fit function E(x) by linear regression, least square fit or any higher order fit"; See: Col. 4 lines 18-24).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Seltmann et al with the teaching of Miwa et al because both references are drawn to lithography for semiconductor manufacturing. The motivation to include the fitting function of Seltmann et al to the exposure system of Miwa et al would be to compensate for exposure system error to reduce CD distribution (See: Seltmann et al).

d. Applicant’s argue:

“Claims 7, 8, 14, 28 and 29 are dependent claims, depending from a distinguishable base claim. Additionally, Applicant submits that Seltmann does not cure the above-noted deficiencies of Miwa. For example, Applicant submits that Seltmann is entirely silent with regard to the terms "aberrated" or "aberration"” (Remarks, pg. 23, last paragraph).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In this case, Miwa et al fails to disclose fitting coefficients values using the response surface functional relation. Seltmann et al cure the deficiency by disclosing fitting coefficients values using the response surface functional relation (such as “calculate a fit function E(x) by linear regression, least square fit or any higher order fit"; See: Col. 4 lines 18-24).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Seltmann et al with the teaching of Miwa et al because both references are drawn to lithography for semiconductor manufacturing. The motivation to include the fitting function of Seltmann et al to the exposure system of Miwa et al would be to compensate for exposure system error to reduce CD distribution (See: Seltmann et al).

e. Applicant’s argue:

“For the reasons set forth above, with regard to independent claims 1, 47 and 48, Applicant respectfully submits that Miwa at least does not teach or suggest means for performing simulation calculations for various levels for each aberration component using the image configuration characteristic data, as recited in claim 42. Moreover, Applicant submits that Lee does not cure the above-noted deficiencies of Miwa. For example, Applicant submits that Lee is entirely silent with regard to the terms "aberrated" or "aberration." Moreover, Applicant notes that the Examiner cited Lee for its purported teachings of the linear motor features of claim 42. Therefore, Applicant submits that Miwa in view of Lee does not teach or suggest each of the features of the present invention, and does not render claim 42 unpatentable” (Remarks, pg. 24, last paragraph).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In this case, Miwa et al fails to disclose at least one linear motor that positions the wafer positioning stage. Lee et al discloses at least one linear motor that positions the wafer positioning stage (such as "a linear motor for aligning the wafer with the lens of the optical system"; See: Col. 3 lines 53-56).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Lee et al with the teaching of Miwa et al because both references are drawn to lithography system. The motivation to include a linear motor of Lee et al with the system of Miwa et al would be to move and align the object stage in a given direction (See: Lee et al).

Claim Interpretation

6. As per claim 15, claim recites “wherein the evaluating step eliminates the need for a full simulation calculation each and every time new specified aberration values are provided and presented for calculation of a new image profile”. The claimed language "eliminates the need for" is just an intended use. This limitation is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

8. Claims 1-6, 9-13, 15, 21-26, and 46-48 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6, 653, 032 issued to Miwa et al.

a. 1. Miwa et al discloses a method of calculating estimated image profiles implemented on a tangibly-embodied storage medium resident on one or more computing devices, comprising the steps of:

providing imaging configuration characteristic data (such as…illumination condition, numerical aperture and illumination coherency, the photoresist parameters...; See: Col. 1 lines 54-60; Col. 4 lines 1-10);

performing simulation calculations for various levels for each aberration component using the imaging configuration characteristic data using a processor of the one or more computing devices (such as…optimize the illumination condition of the optical projection system of the exposure device...; See: Col. 1 lines 55-60);

building response surface functional relations using the processor of the one or more computing devices between variables of lens characteristics and an image profile of interest using the simulation calculations (such as…producing

response surface function of CD values, using exposure energy, focus offset and illumination parameters…; See: Col. 2 lines 50-54); and

evaluating specified aberration values of a lens in relation to the response surface functional relations using the processor of the one or more computing devices to provide an estimate of the image profile in a presence of specified aberration(s) (such as…calculating exposure energy and focus offset from these response surface function…; See: Col. 2 lines 54-56).

b. 2. Miwa et al discloses the method of claim 1, wherein the image profiles which result as part of the evaluating step are used as measures of relative lens adjustment goodness in an iterative lens adjustment optimization routine (See: Col. 2 lines 12-21).

c. 3. Miwa et al discloses the method of claim 1, wherein the imaging configuration characteristic data includes lens data, illumination data and pattern data (such as…lens aberration information, illumination parameters, exposure wavelength, numerical aperture…; See: Col. 6 lines 3-15).

d. 4. Miwa et al discloses the method of claim 3, wherein: the illumination data includes at least one of illumination distribution and illumination wavelength, the lens data includes at least one of lens aberration, numerical aperture, pupil filters and lens configuration; and the pattern data includes object (reticle pattern) layout (such as…lens aberration information, illumination parameters, exposure wavelength, numerical aperture…; See: Col. 6 lines 3-15).

e. 5. Miwa et al discloses the method of claim 4, wherein the imaging configuration characteristic data further includes at least one of pattern bias characteristic information and lens focus (See: Col. 6 lines 3-15).

f. 6. Miwa et al discloses the method of claim 1, wherein the simulation calculations are executed for various levels of each aberration component (such as…calculate the wavefront aberration, and from the obtained wavefront aberration it is possible to calculate the Zernike coefficients…; See: Col. 7 lines 14-16).

g. 9. Miwa et al discloses the method of claim 1, wherein the response surface functional relations correspond to a sample set of lens characteristics with a final output from application of response surface functional relations being an image profile under the influence of lens aberrations (such as…producing response surface function of CD values, using exposure focus offset and the illumination parameters (i.e. set of lens characteristics)…; See: Col. 2 lines 50-56).

h. 10. Miwa et al discloses the method of claim 9, wherein the data configuration characteristic information includes lens characteristics related to variation in single aberration values alone or in combination with one another or with selected items from among the lens characteristics (such as…producing response surface function of CD values, using exposure focus offset and the illumination parameters…; See: Col. 2 lines 50-56).

i. 11. Miwa et al discloses the method of claim 1, wherein the response surface functional relations are related to a look-up table summarizing the results of interpolating the image profile generated by the simulation calculations of the performing step (such as...lookup illumination parameters...lookup reticle circuit pattern information...; See: Fig. 7 #104, #105, and #106).

j. 12. Miwa et al discloses the method of claim 11, wherein the look-up table is direct simulation image profile results or of functional coefficients used to calculate the image profile (such as...lookup illumination parameters...lookup reticle circuit pattern information...; See: Fig. 7 #104, #105, and #106).

k. 13. Miwa et al discloses the method of claim 11, wherein the evaluating step includes determining image profile data points using the look-up table to provide a new image profile associated with specified aberration values (such as...lookup illumination parameters...lookup reticle circuit pattern information...; See: Fig. 7 #104, #105, and #106).

l. 15. Miwa et al discloses the method of claim 1, wherein the evaluating step eliminates the need for a full simulation calculation each and every time new specified aberration values are provided and presented for calculation of a new image profile (such as…the exposure energy and focus is calculated using CD values of a test wafer that is exposure processed while changing the exposure energy and the focus offset within certain tolerance...; See: Col. 2 lines 27-30).

m. 21. Miwa et al discloses the method of claim 1, wherein each different aberration value applied during the performing step leads to one full image

simulation calculation (such as…the exposure energy and focus is calculated using CD values of a test wafer that is exposure processed while changing the exposure energy and the focus offset within certain tolerance...; See: Col. 2 lines 27-30).

n. 22. Miwa et al discloses the method of claim 1, wherein the evaluating step provides one output image profile for each one set of specified input aberration values (See: Col. 7 lines 14-16).

o. 23. Miwa et al discloses the method of claim 1, wherein the response surface function relations are built relating any of variables: (i) position within a specified image plane, (ii) intensity or amplitude, (iii) focus, and (iv) all component aberration levels (such as…producing response surface function of CD values, using exposure energy, focus offset and illumination parameters…; See: Col. 2 lines 50-54).

p. 24. Miwa et al discloses the method of claim 1, wherein the performing step includes the steps of: defining a simulation pixel as a unit of horizontal or vertical, position into which an aerial image is divided (See: Fig. 4); calculating aerial image amplitude or intensity on each simulation pixel (See: Col. 2 lines 24-27); and executing the calculations at defocus positions to provide image profile data including focus response (See: Col. 24-34).

q. 25. Miwa et al discloses the method of claim 1, wherein the evaluating step includes summing an impact from all specified aberration values or

combinations of values defined as aberration coefficients for image profile reconstruction (See: Col. 7 lines 14-16).

r. 26. Miwa et al discloses the method of claim 25, wherein the summing step provides an output of intensity or amplitude vs. at least one of position and focus for the specified aberration values which are an arbitrary set of aberration values (See: Fig. 4).

s. As per Claims 46-48, the instant claims recite substantially same limitation as the above rejected claims 1, and 2, and therefore rejected under the same rationale.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 7, 8, 14, 28, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6, 653, 032 issued to Miwa et al as applied to claims above, and further in view of US Patent No. 6, 493, 063 issued to Seltmann et al.

t. 7. Miwa et al discloses producing a response surface function (See: Col. 2 lines 51-56). However, Miwa et al does not expressly disclose fitted coefficients values using the response surface functional relations.

Seltmann et al discloses fitted coefficients values using the response surface functional relations (such as...calculate a fit function E(x) by linear regression, least square fit or any higher order fit...; See :Col. 4 lines 18-24).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Seltmann et al with the teaching of Miwa et al because both references are drawn to lithography for semiconductor manufacturing. The motivation to include the fitting function of Seltmann et al to the exposure system of Miwa et al would be to compensate for exposure system error to reduce CD distribution (See: Seltmann et al).

u. 8. (Seltmann et al discloses the method of claim 1, further comprising the step of generating a new set of aberration components impact upon image profile coefficient values using interpolative methods using the response surface functional relations using the processor of the one or more computing devices (such as...calculate a fit function E(x) by linear regression, least square fit or any higher order fit...; See : Col. 4 lines 18-24; also “fit curve of Fig 4).

v. 14. Seltmann et al discloses the method of claim 1, wherein the evaluating step includes applying interpolated data of the built response surface functional relations to calculate the image profile for specified aberration values (See: Fit curve of Fig. 4).

w. 27. Seltmann et al discloses the method of claim 1, wherein the evaluating step is performed using a linear equation using fixed functions with coefficients determined in the building step ("linear regression"; see: col. 4 lines 18-24).

x. 28. Seltmann et al discloses the method of claim 1, wherein the building and evaluating steps are performed using a sinusoidal fitting function (See: Fit curve of Fig. 4).

y. 29. Seltmann et al does not expressly discloses applying a Fourier Transformation or Fast Fourier Transform algorithm intended to estimate a Fourier Transformation process. However, Seltmann discloses a linear regression analysis which is inherently includes Fourier transformation process because a Fourier technique is a form of multiple regression analysis.

11. Claims 42-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6, 653, 032 issued to Miwa et al in view of US Patent No. 5, 528, 118 issued to Lee et al.

z. 42. Miwa et al discloses An exposure apparatus, comprising:

an illumination system that projects radiant energy through a mask pattern on a reticle R that is supported by and scanned using a wafer positioning stage (See: Fig. 4);

a system for providing optimal image profiling (such as…calculating the optimum values of the exposure energy and focus offset using the process window for the exposure step...; See: Col. 2 lines 24-26), including:

means for providing image configuration characteristic data (such as…illumination condition, numerical aperture and illumination coherency , the photoresist parameters...; See: Col. 1 lines 54-60; Col. 4 lines 1-10);

means for performing simulation calculations for various levels for each aberration component using the image configuration characteristic data (such as…optimize the illumination condition of the optical projection system of the exposure device...; See: Col. 1 lines 55-60);

means for building response surface functional relations between variables of lens characteristics associated with the image configuration characteristic data using the simulation calculations (such as…producing response surface function of CD values, using exposure energy, focus offset and illumination parameters…; See: Col. 2 lines 50-54); and

means for evaluating specified aberration values of a lens in relation to the response surface functional relations to provide image profile estimates for the specified aberration values (such as…calculating exposure energy and focus offset from these response surface function…; See: Col. 2 lines 54-56).

Miwa et al discloses wafer stage (See: Fig. 3). Miwa et al fails to disclose at least one linear motor that positions the wafer positioning stage. Lee et al discloses at least one linear motor that positions the wafer positioning stage (such as "a linear motor for aligning the wafer with the lens of the optical system"; See: Col. 3 lines 53-56).

It would have been obvious to one of ordinary skill in the art to combine the teaching of Lee et al with the teaching of Miwa et al because both references are drawn to lithography system. The motivation to include a linear motor of Lee et al with the system of Miwa et al would be to move and align the object stage in a given direction (See: Lee et al).

aa. 43. Miwa et al discloses the apparatus of claim 42, further comprising means for applying the aberrated image profile estimates in an optimization calculation method which judges image profile information against defined criteria as part of a lens adjustment optimization calculation (such as “calculating the optimum values of the exposure energy and focus offset using the process window for the exposure step”; See: Col. 2 lines 24-26).

bb. 44. Miwa et al discloses a device manufactured with the exposure apparatus of claim 42 (such as “fabricating semiconductor devices”; See: Col. 1 lines 24-25).

cc. 45. Miwa et al discloses a wafer on which an image has been formed by the exposure apparatus of claim 42 (“Wafer Stage”; See: Fig. 4).

Allowable Subject Matter

12. Claims 16-20 are allowed over a prior art.

13. The following is a statement of reasons for the indication of allowable subject matter: Claim 16 is considered allowable since reading the claim in light of the specification, none of the reference of record alone in combination disclose or suggest the limitation of:

"wherein the building steps includes: providing a fitting function expressed as:

$$I_{spx}(x) = b_0 + b_1 x + b_2 x^2 + b_3 x^3 + \ldots + b_n x^n$$

where I_{spx} is aerial image intensity or amplitude at a simulation pixel *(spx)* and x indicates defocus; and

expressing a change of the coefficients $b_0 \ldots b_n$ described by an order fitting function expressed as:

$$b_{i(with\_aberration)} = b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \Delta b_i(cj)$$

$$= b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \varphi_{0(i,j)} + \varphi_{1(i,j)} c_j + \varphi_{2(i,j)} c_j^{\,2} + \varphi_{3(i,j)} c_j^{\,3} + \ldots + \varphi_{n(i,j)} c_j^{\,n}$$

wherein

$i = 0, 1, 2, 3, \ldots, n;$

$b_{i(with\ aberration)}$ and $b_{i(w/o\ aberration)}$ represents one of the coefficients $b_0 \ldots b_n$ influenced by lens aberrations and the coefficients $b_0 \ldots b_n$ without aberrations, respectively, and

Δbi indicates the change in coefficients and is expressed by an n^{th} order fitting function of jth Zernike coefficient c_j,

$\varphi_{0(i)} \ldots \varphi_{n(i)}$ $\varphi_{0(i,j)} \ldots \varphi_{n(i,j)}$ are the coefficients of the fitting function, determined following the performing step of setup simulations of image profile as a function of regularly iterated values of lens aberration. ".

14. Claims 30-41 are allowed.

15. The following is an examiner's statement of reasons for allowance: claims 30-41 are considered allowable since reading the claims in light of the specification, none of the references of record alone or in combination disclose or suggest the combination of limitations specified in the independent claims, specifically:

"building response surface functional relations between variables of the image configuration characteristics and the image profile of interest using the simulation calculations data input to be fit using:

$$I_{spx}(x) = b_0 + b_1 x + b_2 x^2 + b_3 x^3 + ... + b_n x^n$$

where I_{spx} is aerial image intensity or amplitude at a simulation pixel *(spx)* and x indicates defocus; and

expressing a change of the coefficients $b_0 \ldots b_n$ described by an order fitting function expressed as:

$$b_{i(with\_aberration)} = b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \Delta b_j(cj)$$

$$= b_{i(w/o\_aberration)} + \sum_{j=2}^{Zn} \varphi_{0(i,j)} + \varphi_{1(i,j)} c_j + \varphi_{2(i,j)} c_j^{\,2} + \varphi_{3(i,j)} c_j^{\,3} + ... + \varphi_{n(i,j)} c_j^{\,n}$$

wherein

$i = 0, 1, 2, 3, ..., n;$

$b_{i(with\ aberration)}$ and $b_{i(w/o\ aberration)}$ represents one of the coefficients $b_0 \ldots b_n$ influenced by lens aberrations and the coefficients $b_0 \ldots b_n$ without aberrations, respectively, and

Δbi indicates the change in coefficients and is expressed by an n^{th} order fitting function of jth Zernike coefficient c_j,

$\varphi_{0(ij)} \ldots \varphi_{n(ij)}$ $\varphi_{0(i,j)} \ldots \varphi_{n(i,j)}$ are the coefficients of the fitting function, determined following the performing step of setup simulations of image profile as a function of regularly iterated values of lens aberration. " (as defined in specification page 34 line 15 through page 37 line 23).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KIBROM GEBRESILASSIE whose telephone number is (571)272-8571. The examiner can normally be reached on Monday-Friday 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571)272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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